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October 2004

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## Gleick to Speak at April Water Law Science and Policy Conference

By Steve Ress

**P**eter Gleick, president of the Pacific Institute, will speak at this spring's Second Annual Water Law, Policy and Science Conference at the University of Nebraska-Lincoln City Campus Union April 7-8.

"We're very pleased to announce a speaker of his caliber this early in the planning process for the overall conference," said conference co-organizer Kyle Hoagland, director of the UNL Water Center.

Gleick is co-founder and president of the Pacific Institute for Studies in Development, Environment, and Security. He is internationally recognized as an expert on global freshwater resources, including the hydrologic impacts of climate change, sustainable water use,

privatization and globalization, and international conflicts over water resources.

Two of his more recent books include *The World's Water 2002-2003: The Biennial Report on Freshwater Resources* and *Water in Crisis: A Guide to the World's Fresh Water Resources*.

Gleick will address the two-day conference's first plenary session on "Water Management and Policy: Increasing Competition for a Scarce Resource."



Peter Gleick

(continued on page 4)

## Measurements From Nearly 5,000 Wells Show Groundwater Declines

By Steve Ress

**I**nformation from nearly 5,000 groundwater wells across Nebraska indicates groundwater in the state declined by one to five feet from 2002 to 2003 in many heavily irrigated areas.

Continuing drought and recent legislation to prevent conflicts between groundwater and surface water users have contributed to the

recent declines, said Jim Goeke, a University of Nebraska hydrogeologist.

"At least some of the depletions shown on the latest groundwater-level change map produced by the university are a result of drought-related spikes in well drilling and well pumping statewide," Goeke said.

The map shows groundwater level changes in the High Plains aquifer that underlies much of Nebraska.

Rises and declines in aquifer levels are common and also are affected by soil types, differences in geology and precipitation, said Mark Burbach, an assistant geoscientist with the University of Nebraska-Lincoln.

The latest map, which shows groundwater level changes between spring 2002 and spring 2003, indicates groundwater declines of less than a foot to more than five feet over much of

(continued on page 4)

### INSIDE

- 2 ..... Director's Notes
- 3 ..... Meet the Faculty
- 5 ..... Dealing with Arsenic
- 6 ..... Studying SDI
- 7 ..... Republican River Economics

- 10 ..... Test Kits Travel Far and Wide
- 11 ..... Missouri River EPA Grant
- 15 ..... Water News Briefs
- 16 ..... New Methods and Capabilities

# Status of Water Research at the University of Nebraska

## from the DIRECTOR



Kyle D. Hoagland

By Kyle D. Hoagland, Ph.D.

In our rush to move forward at ever-increasing speeds, we sometimes don't take the time to pause for a moment and look at all we have accomplished. This can be particularly important as we resume our move ahead, for as others have said, it's tough to know where you're going unless you know from where you've been.

We have had an exceptionally productive and successful period of water research, extension and outreach activity over the last couple of years and I thought it might make

sense to recount some of those successes here.

None of this would have been possible without the individual and collaborative efforts of what I believe to be one of the most diverse, capable and talented groups of water research and education faculty and staff at any university in the country. We have become very focused on helping solve state and regional water issues, many of which have become all that more pressing due to one of the most intense droughts the area has experienced in the last 50 years.

It has also been a time of tightening budgets and often having to learn to do more with less, and yet, I think we've responded well to the needs of our fellow citizens in finding ways to better work together and become more innovative and rigorous in our research and outreach programming and reaching out to form new partnerships with other university faculty and staff, as well as with our colleagues in state and federal agencies and natural resources districts across the state.

With all that in mind, here are just some of the state-based water research projects and related extension and outreach efforts that the Water Center has been involved with over the past couple of years, including some on-going projects:

- Hydrologic modeling assistance in both the Platte and Republican River basins.

- Arsenic in drinking water community assistance project in Polk County.

- Economic impact study on the effects of the ongoing drought in the Republican River basin.

- Irrigation efficiency studies such as subsurface drip irrigation and decision-support modeling in western Nebraska.

- Well field site-planning assistance for Sutherland Reservoir in conjunction with Central Nebraska Public Power and Irrigation District (CNPPID).

- Oxygen depletion study and aeration system design assistance for Lake Ogallala in conjunction with CNPPID, Nebraska Public Power District, Nebraska Game and Parks Commission and others.

- Endangered species studies on Pallid Sturgeon in the Platte and Missouri Rivers in conjunction with U.S. Fish and Wildlife Service and others.

- Toxic algal bloom assistance for ponds and lakes throughout Nebraska, including wide distribution of sampling kits in conjunction with the Nebraska Departments of Environmental Quality (NDEQ) and Health and Human Services System and others.

(continued on page 14)

## WATER CURRENT

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# Meet the Faculty

## Suat Irmak, Ph.D.

Assistant professor and water resources and irrigation engineer, Department of Biological Systems Engineering, University of Nebraska-Lincoln. In position since 2003. Member of American Society of Civil Engineers (ASCE) task



Suat Irmak

committees on standardization of reference evapotranspiration, and crop coefficients. Member: American Society of Agricultural Engineers (ASAE) and United States Committee on Irrigation and Drainage (USCID).

### Education:

Ph.D., Agricultural and Biological Engineering with emphasis on water resources engineering, University of Florida, Gainesville, FL.

M.E., Agricultural Structures and Irrigation Engineering with emphasis on water resources engineering, Mediterranean University, Faculty of Agricultural Engineering, Antalya-Turkey, 1996.

B.S., Agric. Structures and Irrigation Engineering with emphasis on comparison of design and feasibility, and economical analyses of sprinkler, drip and surface

(furrow) irrigation methods, Cukurova University, Adana-Turkey, 1992.

### Selected Current Research/Extension Programs:

Efficient use of water resources.

Irrigation system design, selection and management.

Evapotranspiration (energy balance, water balance, weighing lysimeters).

Development and evaluation of innovative methods to increase crop water use efficiency to meet crop water requirements during drought and water-limiting conditions.

Direct measurement of crop water use and crop coefficients using Eddy Correlation and Bowen Ratio methods.

(continued on page 13)

## James W. Goeke

Research Hydrogeologist and Professor, School of Natural Resources, University of Nebraska-Lincoln West Central Research and Extension Center, North Platte, NE. Hydrogeologist (1970-76) and Research Hydrogeologist (1976-present) for the UNL Conservation and Survey Division.

### Education:

B.S., Geology, University of Wisconsin, 1966

M.S., Groundwater Geology, Colorado State University, 1970

### Teaching:

High Plains Water Expo; Water Riches Field Day; Sandhills Academy; Range Camp; GSL Youth Field Day; and Nebraska Water Conference Council/UNL annual water and natural resources tour.

### Research Interests:

Regional groundwater studies; stream/aquifer relationships; meadow hydrology; Sandhills history; and stream evolution.

### Scholarly Survey:

Acid rain/dioxin; groundwater level changes; drought impacts; and Republican River compact resolution.

### Other Professional Activities:

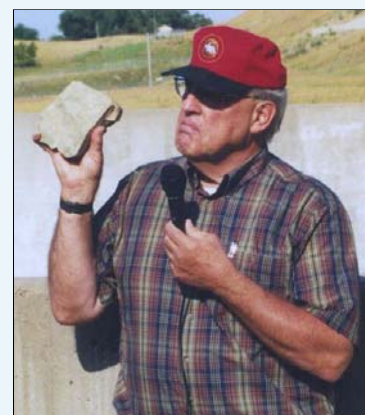
- Board member and Nebraska representative, Ogallala Aquifer Institute
- Board member, Keep Nebraska Beautiful Board
- Member, North Platte Civil Service Commission
- Trustee, Nebraska Nature Conservancy
- Member, Platte River Water management Committee
- Member, Republican River Task Force

Member, Nebraska Statewide Arboretum and Friends of the Viehmeyer Arboretum

### Selected Publications:

- Test Hole Log Books for Arthur, Keith, Lincoln and McPherson Counties, 1999-2001.
- Chen, X.-H., J. Goeke and S. Summerside. 1998. *Geology, Hydrogeology and Aquifer Hydraulic Properties from Five Test*

(continued on page 13)



Jim Goeke



## Gleick to Speak at April Water Management and Policy Conference (continued from page 1)

The conference theme is "Water Management and Policy in the Great Plains: Implications of Drought and Climate Change."

Other nationally known speakers will include Roger Pulwarty of the National Oceanographic and Atmospheric Administration's Climate Diagnostics Center and Kathy Jacobs of the University of Arizona.

Local experts, many of them nationally known in their respective fields of expertise, include Don Willhite, director of the National Drought Mitigation Center at UNL on understanding the hazards and reducing societal vulnerability to drought; UNL geoscientist Sherilyn Fritz on what can be learned from the historical and paleoclimate record on drought; and UNL meteorologist Mike Hays on the impacts and implications of recent droughts in the Great Plains.

"Our list of speakers is growing by the week," Hoagland said.

Current planning is for conference sessions to address the following broad topic areas: 1.) Panel presentations and discussion of climate change and drought; 2.) Drought history and predictability; 3.) Climate change in a fragile ecosystem: Water in the Great Plains; 4.) Decision making under uncertainty: Water management and policy instruments to mitigate drought and climate change; and 5.) Translating science into policy and to the public.

Conference planning continues and a full slate of speakers and topics should be completed soon after the New Year. You should be receiving a postcard mailing on the conference in the next few weeks.

The conference is co-sponsored by UNL's Institute of Agriculture and Natural Resources, School of Natural Resources, College of Law, Water Center, Water Resources Research Initiative, and Public Policy Center.

## Measurements From Nearly 5,000 Wells Show Groundwater Declines (continued from page 1)

Nebraska, particularly in the heavily irrigated Platte, Republican, Loup, Blue and Elkhorn River basins. Only the Sandhills and parts of southeast Nebraska indicate little to no changes in groundwater levels over the past year.

Very few locations indicated a rise in groundwater levels over the past year. In the past 50 years, there has been significant recharge of the aquifer in parts of Dawson, Gosper, Phelps and Kearny counties, where rises of more than 50 feet have been recorded.

This groundwater mound is estimated to contain six to eight million acre feet of water, or about four to five times the 1.75 million acre-foot capacity of Lake McConaughy, Burbach said.

An acre foot of water equals nearly 326,000 gallons.

Other than the groundwater mound, significant, measurable rises in the aquifer are primarily confined to smaller groundwater mounds in Lincoln County and another in Valley, Greeley, Sherman and Howard counties. In both those areas, rises of from five to as much as 40 feet have been recorded.

Other than these notable exceptions, water levels in aquifers underlying Nebraska have remained largely constant over the last 50 years, Burbach said.

"Significant and persistent declines in some areas of the state have only become more obvious in the last few years, due mainly to current drought conditions and resulting increases in groundwater pumping," Burbach said.

Spring water level information from more than 4,800 irrigation, domestic, observation and monitoring wells in

all of Nebraska's 23 Natural Resources Districts (NRD) is used to assemble the map.

Rises and declines in the aquifer from pre-development to spring 2003 also are depicted on the map. Predevelopment is generally regarded as before 1952, when irrigation usage became more widespread, Burbach said.

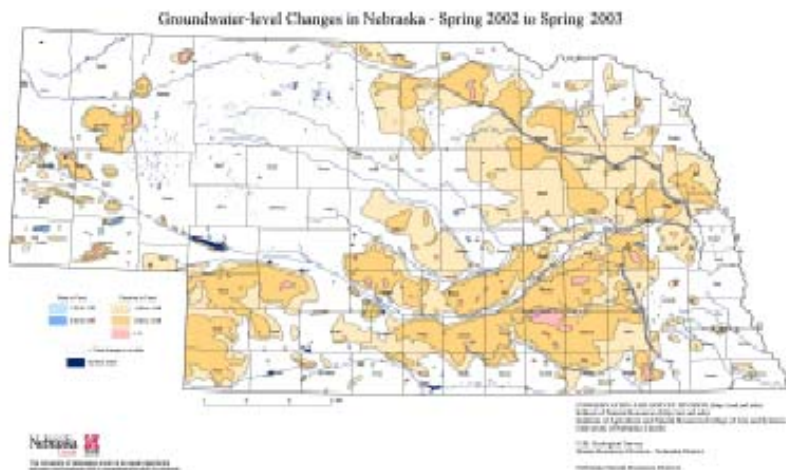
"You can begin to track declines in aquifers after the 1960s and 1970s when drilling irrigation wells showed a dramatic upswing, due

in part to the advent of center pivot irrigation," he said.

A similar spike in well drilling is occurring now due to the drought and the Legislature's passage this spring of LB962, which makes the state and NRDs more proactive in anticipating and preventing conflicts between groundwater and surface water users.

"Under this law, any river basin whose water is determined to be fully or over appropriated has to develop and implement an integrated surface water and

(continued on next page)



A map produced by the Conservation and Survey Division of UNL's School of Natural Resources shows groundwater change levels that occurred in Nebraska from 2002 to 2003. The changes over one year have been significant in some areas, due in part to continuing drought conditions in many areas of the state.

# Combating An Odorless, Tasteless, Unseen Problem in Nebraska Drinking Water

By Steve Ress

**Y**ou can't see it, taste it or smell it, but a number of Nebraska communities and private well users have to deal with the specter of arsenic contamination in their drinking water.

For more than 60 years, the maximum allowable limit for arsenic in public drinking water supplies has been 50 parts per billion (ppb) and most public drinking water suppliers have been able to meet that standard.

Recent reports indicate that the U.S. Environmental Protection Agency (EPA) may have underestimated the cancer risks of arsenic in drinking water, causing the agency to reduce the standard to 10 ppb beginning in January 2006.

This lowered standard may be difficult for many of Nebraska's smaller communities to meet.

"As many as 82 Nebraska public water systems have historic arsenic levels greater than 10 ppb. Many of these systems are concentrated in the panhandle, southwest and south central areas of the state," said UNL extension educator Sharon Skipton.

It's a difficult contaminant to control since it occurs naturally in most cases and can't be detected by taste, sight or smell.

"The only way to know the concentration of arsenic in water is through testing," Skipton said.

Of the 82 public systems affected by the new arsenic rule, some may be able to meet the new standard by shutting down or replacing one or two wells.

"Others will need to find other alternatives, which could range from finding new wells containing water with lower arsenic concentrations, treating the water, or becoming part of a larger rural or community water district," she said.

Research is being conducted at the University of Nebraska-Lincoln to help communities find effective,

economical ways for public systems to meet the new 10 ppb standard. EPA is also providing millions of dollars for research and development of more cost-effective technologies to meet the new standard, Skipton said.

All public water systems may be granted three additional years to comply with the revised standard past the January 2006 implementation date and systems serving 3,300 or fewer people could be eligible for an additional six years beyond that for a total of nine years.

Private wells are not regulated.

"Arsenic concentrations can vary greatly from well to well, making the prediction of arsenic concentrations in a specific well very difficult," Skipton said.

She encourages private well users

to have their wells checked for arsenic

if arsenic is suspected; such as in

private wells located near a public well with elevated arsenic or in a geographic region with a concentration of wells with elevated arsenic.

Existing treatment options that can be used

to reduce arsenic concentration include reverse osmosis

and distillation. For more information on these

treatment

options, see UNL Cooperative Extension NebGuides G03-1490 *Drinking Water Treatment: Reverse Osmosis* and G03-1493 *Drinking Water Treatment: Distillation*.

Nebraska laboratories approved to test private drinking water for arsenic include:

Nebraska Health and Human Services, Department of Regulation and Licensure, Public Health laboratory, 3701 S. 14th St., Lincoln, NE 68502, (402) 471-2122; Servi-Tech Laboratories, 1602 Park West Dr., Hastings, NE 68901, (402) 463-3522; and Midwest Laboratories, Inc., 13611 B St., Omaha, NE 68144, (402) 334-7770.

To contact Skipton for additional information phone (402) 472-3662.

*"The only way to know the concentration of arsenic in water is through testing."*

## Measurements From Nearly 5,000 Wells Show Groundwater Declines (continued from page 1)

groundwater management plan," Goeke said. Such plans have the potential to limit irrigation use of both surface water and groundwater.

The increase in groundwater irrigation and recent groundwater declines due to the drought and increased pumping of wells also has a direct bearing on why some stretches of Nebraska's rivers and streams are dry, said Goeke, who is with UNL's School of Natural Resources and is based at the West Central Research and Extension Center in North Platte.

"The increase in pumpage and diminished recharge to the aquifer due to the drought disrupts groundwater flow to streams, delaying or diminishing the flow of surface water to many basins," he said.

The High Plains aquifer underlies more than 104 million acres of land in South Dakota, Wyoming, Nebraska, Colorado, Kansas, New Mexico, Oklahoma and Texas.

For copies of the groundwater-level change map, contact Judy Otteman at (402) 472-7523 or go to <http://csd.unl.edu/general/newpub-gwmaps.asp> online.

# UNL Researchers Studying SDI Technology Near Clay Center

By Steve Ress

University of Nebraska researchers have been burying plastic drip irrigation tubing in fields near Clay Center to get a better idea of how sub-surface drip irrigation (SDI) technology might help Nebraska farmers increase crop water use efficiency, reduce chemical leaching to groundwater and help conserve water resources.

Earlier this year, UN researchers used several miles of Netafim-USA SDI lines (also known as drip tubing or drip lines) to irrigate a previously dryland, 33-acre cornfield at UNL's South Central Agricultural Laboratory near Clay Center.

Drip lines were buried about a foot below the surface of the field, in the crop root zone, so SDI effectiveness at improving irrigation efficiency, crop water use efficiency and fertilizer application can be assessed and best management practices can be developed for SDI-irrigated corn.

"Burying the drip lines also reduces the evaporation loss which is a significant portion of the evapotranspiration process in Nebraska's typical climate conditions," said water resources engineer Suat Irmak of UNL's Department of Biological Systems Engineering.

Co-researcher Richard Ferguson, a soils specialist in UNL's Department of Agronomy and Horticulture, said that he hopes the project will help answer these and other cropping and irrigation questions.

Initial research with the SDI system will include nearly a dozen different treatments to assess irrigation scheduling, crop water use efficiency, crop evapotranspiration and crop coefficients, as well as application of fertilizers and chemicals through the system's underground drip lines.

At Clay Center, the lines have been buried a foot deep and 60 inches apart, with one line positioned every-other



Spools of plastic subsurface irrigation line, or drip tape, are buried about a foot below the surface of this field at UNL's South Central Agricultural laboratory near Clay Center (photo: Suat Irmak).



Installing subsurface drip irrigation lines at UNL's South Central Agricultural Laboratory near Clay Center (photo: Suat Irmak).

row. The emitters on the lines are 18 inches apart and are pressure-compensated so there is near-constant flow along a line regardless of changes in system pressure, Irmak said.

(continued on page 10)



Water Resources Engineer Jose Payero from UNL's West Central Research and Extension Center in North Platte talks with Marsha Trompke of Central Nebraska Public Power and Irrigation District in Holdrege at a Kansas State University subsurface drip irrigation field day in Colby, KS in July (photo: Steve Ress).



Examining equipment used to install subsurface drip irrigation drip lines at a Kansas State University subsurface drip irrigation field day in Colby, KS in July (photo: Steve Ress).



# UNL Study Looks at Economic Impacts of Water Allocations To Republican River Basin Economy

**R**ecently proposed water allocations and retirement of groundwater-irrigated acres will have modest impact on the overall economy of the Republican River basin, according to University of Nebraska-Lincoln agricultural economist Ray Supalla.

The two-month long study was commissioned by a group of power districts, banks and farm supply companies. Preliminary results were made public at a late July meeting of the Republican River Management Districts Association.

The study analyzed consequences of reduced irrigation in the Republican valley and provided economic information for making water policy decisions.

"You can't cut back a lot without having a big change in the economy. It's not the actual number of certified irrigated acres that's important, it's that you do the reduction the same way for everyone to be fair," Supalla said.

The study noted that the basin has a total economic output of about \$4.4 billion per year and employs more than 55,000 people. Without Lincoln and Kearney Counties, which are on the basin's periphery however, regional output and employment is only 3.0 billion and 36,000, respectively, he said.

Water restrictions considered in the study include reductions of 10 percent, 20 percent and a worst-case scenario of 13 percent plus an additional 120,000 acre-feet of reduced pumping for quick response wells, amounting to about 40,000 acre-feet of water.

An acre-foot of water is enough water to cover one acre of land with water one foot deep, or about 326,000 gallons.

A 10 percent reduction in groundwater use would reduce total pumping by 110,000 acre-feet and would cost the basin about \$5.6 million in value added receipts, Supalla said.

"This cost is equivalent to \$53 for each one acre-foot change in pumping and to \$196 for each one-acre foot change in consumptive use," Supalla said.

Under the worst-case drought policy, restrictions would reduce net returns to agriculture by \$31 per affected acre and cost the Republican valley \$32.5 million in value added. This is equivalent to \$125 per acre-foot of reduction in pumping and to \$287 per acre-foot reduction in consumptive use, he continued.

The study said pumping reductions could slow land value increases, but a decline in average land values is doubtful, except perhaps for dry crop land that had irrigation potential before well drilling ceased in the basin.

"On the other hand, reduced pumping on land values would most likely affect the number of properties classified as dry land with irrigation potential.

"It's important to keep in mind that the impacts on land values depend as much on an unknown market psychology factor as on the economic returns, especially in the short run," the study says.

Much of the land value effect may already be reflected in the current market, Supalla said.

The Middle Republican Natural Resources District was used as the study example with Supalla saying there are variables in the Lower and Upper Republican NRDs, including that "It takes more water in the west to get a yield."

The study did not consider the effect of surface water availability, or any programs that might mitigate some of the economic losses for farmers. These variables could make a big difference in the economic outcome, he said.

Study results could be of interest to the U.S. Department of Agriculture's Conservation Reserve Enhancement Program (CREP) and Environmental Quality Improvement Program (EQUIP) and other programs that offer incentives for farmers to take irrigated land out of production.



Ray Supalla gives a presentation on UNL's Market Journal program in this file photo from Husker Harvest Days at Grand Island in 2003 (photo: Steve Ress).

This would soften the impact on farmers, especially operators of quick response wells, but would worsen the impacts on the regional economy. Farmers get compensated for their losses in this instance, while those who supply agricultural inputs and handle grain suffer more from land retirement than they would from a comparable regulatory scenario, Supalla said.

He emphasized that study results assume farmers respond optimally to water limiting regulations.

"This is a difficult task and will require a great deal of education and inevitably some trial and error. If farmers succeed in responding optimally, the aggregate economic consequences for the region will be modest, but if too many mistakes are made the consequences could be severe," he said.

Assisting Supalla with the study was graduate assistant Scott Nedved.



# Husker Harvest



Dave Varner and Richard Ferguson chat with Governor Mike Johanns.



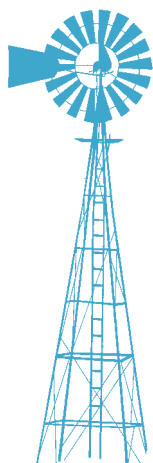
Students show-off one-quarter scale tractors that they displayed in front of the IANR building at this year's Husker Harvest Days show.



Bob Meduna and Lisa Moravec of Foundation Seed Division answer questions.

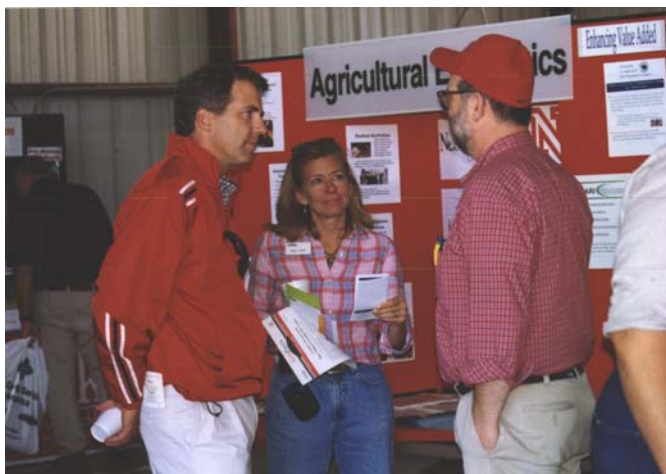


UNL's Husker Red metal building just prior to the start of another day of visitors at Husker Harvest Days.



**Sept. 14-16**  
**Grand Island, NE**

# Days 2004



University of Nebraska president J.B. Milliken and wife Nana Smith talk to water law specialist Dave Aiken.



Pesticide education specialist Larry Schulze entertains some of the younger crowd at Husker Harvest Days.



Sandi Alswager and Betty Castan of Communications and Information Technology distribute information to show goers.



Getting a picture taken at 4-H's display inside the IANR building at Husker Harvest Days.



Picking-up materials from the UNL Water Center display.



# Algae Test Kits Travel Far and Wide

About 40 percent of the blue-green algae samples tested by the University of Nebraska-Lincoln were positive for the presence of potential toxin producing blue-green algae and more than 400 sample kits have been sent to algae testers from Adams to York this summer.

"Response to the free test kits has been phenomenal," said UNL School of Natural Resources water quality specialist Tadd Barrow.

Of the 407 free test kits sent to those requesting them, 127 were returned with a sample of pond or lake water for testing by UNL's Aquatic Ecology and Limnology Laboratory. About 35 of the kits were distributed to those visiting the UNL Water Center display at Husker Harvest Days in Grand Island in September.

"Requests for test kits have come from all areas of Nebraska and even Iowa," Barrow said.

"Due to the closing of a number of public lakes earlier this summer because of blue-green algae blooms, Nebraskans are acutely aware of the problem and many of those who live on lakes or ponds want to test their own pond water. The test kits have been a great answer for them," said Steve Ress, communications coordinator at the UNL Water Center.

Nebraska towns from where requests have been made include: Adams, Albion, Ashland, Ayr, Bassett, Beatrice, Beaver Crossing, Bennet, Bennington, Blair, Bridgeport, Cedar Bluffs, Cedar Creek, Clarks, Clarkson, Clatonia, Cody, Colin, Columbus, Crete, Davenport, David City,

Decatur, Denton, Doniphan, Dorchester, Douglas, Dunbar, Duncan, Elkhorn, Elmwood, Fort Calhoun, Franklin, Fremont, Genoa, Gibbon, Gothenburg, Grafton, Grand Island, Gresham, Gretna, Hayes Center, Herman, Jansen, Johnson, Kearney, LaVista, Leigh, Lexington, Lincoln, Malmo, Marquette, Maxwell, McCool Junction, Mead, Memphis, Morse Bluff, Nebraska City, Norfolk, North Bend, North Platte, Omaha, Papillion, Plattsmouth, Ravenna, Raymond, Rising City, Schuyler, South Bend, Springfield, St. Libory, St. Paul, Stanton, Stromsburg, Valentine, Valley, Waterloo, Waverly, Wellfleet, West Point, Wilber, and York.

"We've pretty well blanketed the state with test kits," Barrow said.

Fifty-five water samples received by the university tested positive for blue-green algae; 20 of which were above the two parts per billion (2 ppb) limit set by the Nebraska Department of Environmental Quality. All 55 of those samples were sent to the NDEQ, which has been testing for blue-green algae toxin and tracking the blooms across the state this summer in response to the unusually high number of incidents across Nebraska.

"That number doesn't include the second, third, fourth or more samples tested for some individual lakes and ponds," Barrow said.

University kits contain instructions on proper sample collection, a sheet for recording measurements, a questionnaire about the lake, and sample bottles for water and algae. Samples are returned to Barrow for

processing and those who submit samples are notified of results.

Blue-green algae, which are cyanobacteria, are microscopic organisms commonly found in lakes and ponds worldwide. Special characteristics of blue-green algae often allow them to multiply faster than other types of algae, said UNL School of Natural Resources water quality specialist John Holz.

This rapid algal growth is called an algae bloom. Blooms can appear and linger anywhere from days to weeks. They are most common in the warmer months from May to September, according to UNL Water Center director and lake ecologist Kyle Hoagland.

Some types of blue-green algae produce chemical toxins that can harm people and animals. "These colorless and odorless toxins may linger in the water for as long as two weeks after the bloom has disappeared," Hoagland said.

Numerous environmental factors can trigger a bloom, lakes with higher concentrations of nutrients, or fertilizers, especially phosphorus, generally tend to be more susceptible to blue-green blooms, he added.

A current list of Nebraska lakes with known problems and health advisories can be found online at <http://www.deq.state.ne.us>.

To request a free test kit, contact Barrow at (402) 472-7783 or the UNL Water Center at (402) 472-3305. Lake algae blooms should have largely disappeared by mid-October, Barrow said.

## UNL Researchers Studying SDI Technology Near Clay Center (continued from page 6)

The well and filtration system (used to help keep any particles from plugging the emitters or drip lines) are installed at the head of the field, Ferguson said.

At the opposite end of the field the drip lines attach to a flush line so the drip lines can be flushed whenever necessary.

Additional UNL SDI research,

occupying a smaller land area but with more plots, is being conducted at the West Central Research and Extension Center at North Platte and the Panhandle Research and Extension Center at Scottsbluff.

SDI has already proven to be useful in such niche applications as fields that are too small or too irregular in size or shape to use a center pivot system and

in areas where fruit, vegetable and flower crops are grown. It can also be more efficient in getting water and nutrients to crops in areas where only limited irrigation water is available.

Project funding is from a Burlington-Northern Endowment Foundation grant, Netafim-USA and UNL's Agricultural Research Division.



# Missouri River Study Nets EPA Grant

A grant from the U.S. Environmental Protection Agency will provide approximately \$31,500 to UNL for a year-long pilot project related to the concept of adaptive management on part of the Missouri River. The UNL study continues a project began two years ago to increase citizen participation and stakeholder collaboration in the Missouri River basin.

The project's primary purpose is expanding input and involvement of local community stakeholders in Otoe County, NE, Atchison County, MO, and Fremont County, IA.

"Other aspects of the project include synthesizing existing data to use in developing ecological, social, and economic models as well as small-scale habitat restoration projects," said Meghan Sittler,

Academic Adviser for the UNL Environmental Studies Program and Environmental Resource Center.

This will be done while meetings and workshops designed to increase collaboration, citizen participation, and dialogue are being held to help restore ecological, economic, and social health issues in the basin.

"The final product will be a proposed site where mitigation projects may be implemented for river restoration with continued citizen involvement," Sittler said.

The Missouri River is one of the nation's most ecologically endangered rivers. It not only is vital to fish and wildlife but also to the economic and social well being of the entire Great Plains, she said. Because of the vastness of the basin and a wide range of social and economic

interests, the river has been the source of debate for the last 25 years.

"Its future has become a main concern of [US] Senator Ben Nelson, who along with his staff, was very active in assisting us during the pursuit of this grant opportunity," said Robert Kuzelka, Associate Professor Emeritus in UNL's School of Natural Resources and Program Director for the UNL Environmental Studies Program, who will direct the project with Sittler, "we send our sincere appreciation for the Senator's support."

The grant is part of EPA's Water Quality Cooperative Agreement program, which focuses on improving water quality through watershed and community-based planning and management.



Rodney Verhoeff of the Lower Platte River Corridor Alliance briefs participants on an LPRCA airboat tour of the lower Platte River near Louisville. Water and urban development projects along the river were viewed on the daylong tour that gave participants a unique perspective of the river (photo: Steve Ress).



UNL Water Center director Kyle Hoagland gets ready to make a presentation on toxic blue-green algae at one of the stops on the Lower Platte River Corridor Alliance's July airboat tour of the lower Platte River corridor (photo: Steve Ress).

## Lower Platte River Airboat Tour

With help from UNL Water Center associate director Mike Jess (left), UNL School of Natural Resources emeritus professor and geologist Robert Diffendal (right) presents on the geology of the Platte and Missouri River basins at the time of the Lewis and Clark expedition during July's Lower Platte River Corridor Alliance airboat tour of the lower Platte River (photo: Steve Ress).

# Free Lectures Honor Memory of UNL Scientist, Former SNRS Head

Lectures continue in the annual UNL School of Natural Resources Seminars that began Sept. 1 and run weekly through Nov. 17

Local and regional experts are addressing a variety of environmental and ecological topics in this series of free weekly public lectures on University of Nebraska-Lincoln's East Campus.

The lectures are being held most Wednesdays through Nov. 17, said organizer Jim Merchant, a professor in the School of Natural Resources. They are presented in Room 116, L.W. Chase Hall on the UNL East Campus from 3:30 to 4:30 p.m. A 3 p.m. social precedes each lecture.

"I am particularly pleased at the range of topics we are presenting this fall. I think we have at least one or two that anyone might find interesting. Each of the topics has relevance to our quality of life here in Nebraska," Merchant said.

Seminar speakers have hailed from UNL and Doane College, as well as from other universities and agencies in Colorado, Illinois, Wisconsin, South Dakota, and Arkansas.

Keith Paustian of the Natural Resources Ecology laboratory at Colorado State University, Ft. Collins, CO began the seminar with a retrospective on the life and science of E.T. "Ted" Elliot.

Elliott, who died in 2002, was a former director of UNL's School of Natural Resource Sciences and an accomplished scientist, Merchant said.

"His scientific achievements were marked by an extraordinary vision of how living organisms, from microorganisms to humans, are linked through the manifold nature of soil. His work revolved around a search for the connectiveness of life and soil from the individual cell to the globe," he said.

Several of the lectures are being presented as memorials to Elliott.

The lectures are presented by the UNL School of Natural Resources, Institute of Agriculture and Natural Resources and UNL. For more information on the lectures or parking arrangements on the UNL East Campus, phone (402) 472-3305 or email [sress1@unl.edu](mailto:sress1@unl.edu).

Remaining lectures in the seminar include:

- Oct. 27: **TBA**
- Nov. 3: **Mark Kuzila, UNL School of Natural Resources, Lincoln, "A Study of Soils and Landscapes in the Rainwater Basin Area of Nebraska."**
- Nov. 10: **David Kremetz, Arkansas Cooperative Fisheries and Wildlife Research Unit, University of Arkansas, Fayetteville, AR, "Fall Migration Ecology of Shorebirds through the Mississippi Valley."**
- Nov. 17: **Tala Awada, School of Natural Resources, Lincoln, "Water Use of Trees and Grasses in the Nebraska Sandhills."**



UNL School of Natural Resources associate director Dave Gosselin (left) and director Mark Kuzila (center) serve-up ice cream to faculty, staff and students at a mixer shortly after the start of the fall academic semester (photo: Steve Ress).

# Meet the Faculty

**Suat Irmak** (continued from page 3)

Use of climate information in agricultural water management.

## Selected Past Research/Extension Programs:

- Estimation and direct measurement of reference evapotranspiration.
- Sensor-based irrigation scheduling.
- Use of modified atmometers (evapotranspiration gages) to estimate crop water use.

## Selected Extension/Outreach Programs:

- Use of modified atmometers (evapotranspiration gages) to estimate crop water use. Introduction of the ET gages to the State of Nebraska for their use by the growers, extension educators and crop consultants to monitor their own crop water use is being promoted at different Cooperative Extension and public education venues throughout Nebraska.
- Water savings and conservation strategies using conventional subsurface drip irrigation (SDI) and low pressure SDI (LPSDI) are being studied and educational programs are being developed to help inform growers, extension educators and crop consultants through field days and seminars.

- Using soil water content and soil matric potential sensors for agricultural water management.

## Selected Publications:

- Irmak, S., M.D. Dukes, and J.M. Jacobs, 2004. Using modified Bellani plate evaporation gauges to estimate short canopy reference evapotranspiration. *J. Irrig. and Drain. Eng.*, ASCE (in press).
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- Irmak, S., A. Irmak, J.W. Jones, T.A. Howell, J.M. Jacobs, R.G. Allen, and G. Googenbom, 2003. Predicting daily net radiation using minimum climatological data. *J. Irrig. and Drain. Eng.*, ASCE 129(4): 256-269.
- Irmak, S., A. Irmak, R.G. Allen, and J.W. Jones, 2003. Solar and net radiation-based equations to estimate reference evapotranspiration

in humid climates. *J. Irrig. and Drain. Eng.*, ASCE 129(5): 336-347.

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**James W. Goeke** (continued from page 3)

*Sites in the Republican River Valley, Nebraska.* Contract report for Nebraska Department of Water Resources.

- Bentall, R. and J. Goeke. 1995. *Map Observation of Nebraska Drainage Systems*. GSA Abstract.
- Goeke, J., A. Matherne and D. Bosselin. 1994. *Hydrogeologic Dynamics of the Wet and Dry Valleys at the Gudmundsen Sandhills Research Laboratory*. UNL, Proceedings Report WCC 94-01.

- McClean, J.S., H.-H. Chen and J. Goeke. 1994. *Simulation of Ground Water Movement in the High Plains Aquifer, Southern Sandhills Area, West Central Nebraska*. USGS Open File Report 94-XXX, 50 pp.
- Kranz, B., J. Goeke and D. Hay. 1993. *Understanding Groundwater*. UNL-IANR NebGuide, G93-1128.
- Kranz, B., D. Gosselin, D. Hay and J. Goeke. 1993. *Glossary of Water Related Terms*. UNL-IANR NebGuide, G93-1191.

- Goeke, J.W. 1992. *Hydrogeology of Parts of the Twin Platte and Middle Republican Natural Resources Districts Southwestern Nebraska*. Nebraska Water Survey Paper No. 70, 89 pp.

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## From the Director (continued from page 2)

- Community Lake Evaluation and Restoration (CLEAR) team for renovating small community lakes and ponds throughout Nebraska in conjunction with the NDEQ.

- Lake classification study for Nebraska that included classification of 325 lakes, reservoirs and sand pit lakes across Nebraska in conjunction with NDEQ, U.S. Environmental Protection Agency and others.

- Annual water and natural resources tours of major river basins and discussion of associated issues in Nebraska for the benefit of producers, irrigators, legislators, teachers and natural resource professionals in conjunction with the Kearney Area Chamber of Commerce, Nebraska Water Conference Council and others.

- Long-term groundwater data collection and mapping for Nebraska in conjunction with UNL's School of Natural Resources - Conservation and Survey Division.

- National and international leadership in drought mitigation strategies, education and outreach.

- Regional leadership in global climate change research related to water.

- Ongoing student training in the water sciences in conjunction with NDEQ, DNR, NGPC, NRD's, USGS, USFWS, USACOE, local consulting firms, irrigation manufacturers, etc.

### Water Resources Research Initiative

Some of you have been asking about the status of our new Water Resources Research Initiative (WRRI). In brief, the WRRI has become a very bright star for furthering water research efforts here at UNL. Vice Chancellor Prem Paul initiated the WRRI in the fall of 2003. Sheri Fritz at the Department of Geosciences, Sandy Zellmer at the College of Law, and I are co-leading this initiative.

Though less than a year has passed since its inception, we have already made strides toward making the WRRI one of the driving motives behind water-related research and education. We still have a long way to go, of course, but our progress to date has been measurable and significant in a number of areas.

Following is a chronological listing of activities to date:

- A WRRI steering committee has been formed with broad representation of water faculty from across the campus.

- The initiative has begun to foster greater collaboration with state agencies on several key issues of prominence to Nebraskans, including the Cooperative Hydrology Study (COHYST) on the Platte River and statewide arsenic in drinking water remediation project for small communities.

- Water research collaboration has increased markedly. New research teams have been formed and several large external proposals have been submitted that address water issues in Nebraska, including the following:

National Science Foundation (EMSI program)  
*"Emerging contaminants in agricultural watersheds."*

National Science Foundation (CLEANER): *"An engineering analysis network for adaptive infrastructure management across the community-watershed interface."*

National Science Foundation (IGERT): *"The water cycle and its societal dimensions - improving environmental decision making (graduate training grant)"*

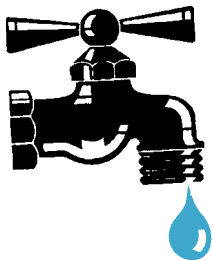
National Science Foundation (CUAHSI): *"Hydrologic Observatory for the Platte River."*

- Three critical faculty positions have been filled in the areas of water law, water quality and aquatic chemistry, with four additional water faculty positions to be advertised early this fall in ecological economics, hydrologic modeling, river ecology and climate modeling.

- The First Annual Water Law, Policy and Science Conference, "Finding Solutions to Multi-jurisdictional Water Conflicts" was held at the UNL College of Law in March with 270 attending. This was the first of several national-level annual conferences that will be held. The second, "Water Management Under Stress: Climate Change, Drought and Water Quantity" is being planned for April 7-8, 2005 at the UNL City Campus Union.

- The UNL Water Sciences Laboratory has been significantly upgraded with the addition of state-of-the-art analytical equipment that further emphasizes its role as a national leader in the detection of trace organic contaminants.

- Expansion and redefinition of the Water Center's annual spring semester public (and for student credit) seminar series that will include more presentations pertinent to state and regional water resource issues and recruitment of more nationally-known speakers.



# Water News Briefs

## Installing and Maintaining Riparian Buffers on Video/DVD

University of Nebraska Cooperative Extension has a new video for farmers and landowners who want to install riparian grass or forest buffers on their fields.

The 45-minute video is full of practical tips for selecting the proper plants, preparing the site, planting trees and grasses and post-planting care to insure their survival, said extension agroforestry specialist Scott Josiah.

"Extension specialists and others describe how to plan and design an effective buffer, selecting the right trees, shrubs and grasses, planting techniques, and long-term maintenance," Josiah said.

UNL research has proven that riparian buffers improve water quality and wildlife habitat and can provide income through the harvest of specialty crops planted in the buffer, which are detailed in the video, said surface water management engineer Tom Franti.

"The benefits of riparian buffers, particularly in regard to water quality, from reducing soil, pesticide and nutrient runoff from fields into adjacent rivers, streams or ponds, is well proven by years of both research and practical use," Franti said.

In the video, Nebraska farmers talk informally about their experiences with buffers. A Cooperative Extension NebGuide is being prepared to accompany the video.

Copies of the video or DVD can be ordered from Betty Castan at (402) 472-3035 or email [bcastan1@unl.edu](mailto:bcastan1@unl.edu), or contact your local Cooperative Extension office.

## Two Earn NASA Fellowships

University of Nebraska-Lincoln School of Natural Resources graduate students have been awarded prestigious NASA Earth System Science Fellowships for their research.

Recipients are Kirsten de Beurs of the Netherlands and Giorgio Dall'Olmo of Italy. Both conduct research in cooperation with scientists in UNL's Center for Applied Land Management Information Technologies, or CALMIT.

de Beurs received a fellowship for her research uses satellite technology to examine the role of climate change and institutional change on agricultural land use in northern Eurasia by using satellite technology.

Dall'Olmo earned his fellowship for research on using light reflectance to remotely measure chlorophyll content of coastal waters to help determine overall water quality for development of aquaculture.

Both are doctoral students majoring in natural resources and will stay at UNL to conduct their research.

Nationally, 57 students received fellowships this year. It's unusual for two students from the same school, let alone department, to win a NASA fellowship, said Don Rundquist a School of Natural Resources professor who heads CALMIT.

"It is significant not only that UNL received two of these very competitive fellowships, but that both students are in the same unit and even share office space," he said.

The \$24,000 annual national fellowships are renewable for up to three years total to help support the students and their research at UNL, he said.

Fellowships help train scientists to support NASA's mission of understanding and protecting the planet.

## Kuzelka Receives NACTA Teaching Award

Bob Kuzelka, associate professor in UNL's School of Natural Resources and director of UNL Environmental Studies, received the 2004 Teaching Award of Merit from the North

American Colleges and Teachers of Agriculture (NACTA) in March.

The annual award recognizes meritorious efforts in college teaching and is given in conjunction with the University of Nebraska, and UNL's College of Agricultural Sciences and Natural Resources and School of Natural Resources.

CASNR Dean Steve Waller said Kuzelka was selected for the award based on his outstanding career as an educator and student mentor and for his energy and enthusiasm in the classroom. Kuzelka is able to empower students to achieve more than thought was possible, Waller said.

The water resources planner and past assistant to the directors of both the Conservation and Survey Division and UNL Water Center, has taught classes in natural resource policy and management.

## Husker Harvest Days Winners

Thanks to all you who visited the Water Center's display in the Institute of Agriculture and Natural Resources' Big Red building at Husker Harvest Days, near Grand Island in September.

Winners in the Water Center's drawing for three rain gauges and three pocket knives were: Dennis Keil, Louisville; LaVon D. Beans, Cozad; Marlene Rahder, Atkinson; Gordon Hultquist, Grand Island; Josh Cod, Grand Island; and Robert Bjorklund, Grand Island.

Congratulations to all of the winners and we look forward to seeing all of you at next year's show.

## Summer Tour Dates

The 2005 Water and Natural Resources Tour will be June 28-30, departing and ending at Kearney. Early planning is for the tour to stop at a variety of locations in the Sandhills and for some discussion to center on the implications of LB962.

The tour's planning committee has met twice and it is anticipated that they will make their first pre-tour planning trip to the Sandhills to view possible stops and talk with potential speakers, sometime before the New Year.

More details will be published in the Spring issue of the *Water Current*.

# New ICP-MS and Methods Continue Update of WSL Analytical Capabilities

By Daniel D. Snow, Ph.D.,  
Director of Laboratory Services,  
UNL Water Sciences Laboratory

New equipment and methods for using it continue to update analytical capabilities of the UNL Water Sciences Laboratory (WSL).

A state-of-the-art inductively coupled plasma-mass spectrometer (ICP-MS) was installed in August. The GV Instruments Platform XS ICP-MS permits ultra trace (sub-ppb) analysis of metals and nonmetals, isotope ratio analysis, and speciation studies for a variety of complexes such as arsenic, mercury and selenium.

An ICP-MS uses high temperature argon plasma to ionize metals and other elements prior to separation and detection using a quadrupole mass spectrometer.

The Platform XS incorporates a dynamic collision cell to selectively remove interferences and enhance focusing of ions providing very low noise levels and remarkable detection limits. It is rugged and easily adaptable and will be configured for speciation studies using liquid chromatography/ICP-MS.

The instrument complement the lab's existing mass spectrometry instrumentation and expand our instrumental capabilities in trace metals and other inorganic contaminants.

A search is nearly completed for a new WSL staff member who will be responsible for operating and maintaining the Platform ICP-MS. The new research technologist at the lab will also assist in sample preparation and operation of instrumentation for stable isotopes.

New methods are continuously developed as needed to meet research needs. A new method was developed over the summer to analyze low levels of caffeine

in groundwater to use as a wastewater tracer. The new method has a lower detection limit (0.010 ppb) than the previous method and employs a polymer based extraction technique and <sup>13</sup>C-labeled caffeine for the internal standard.

More information and a brochure listing methods available at the WSL can be found online at <http://waterscience.unl.edu>. The WSL is part of the UNL Water Center and UNL School of Natural Resources.

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